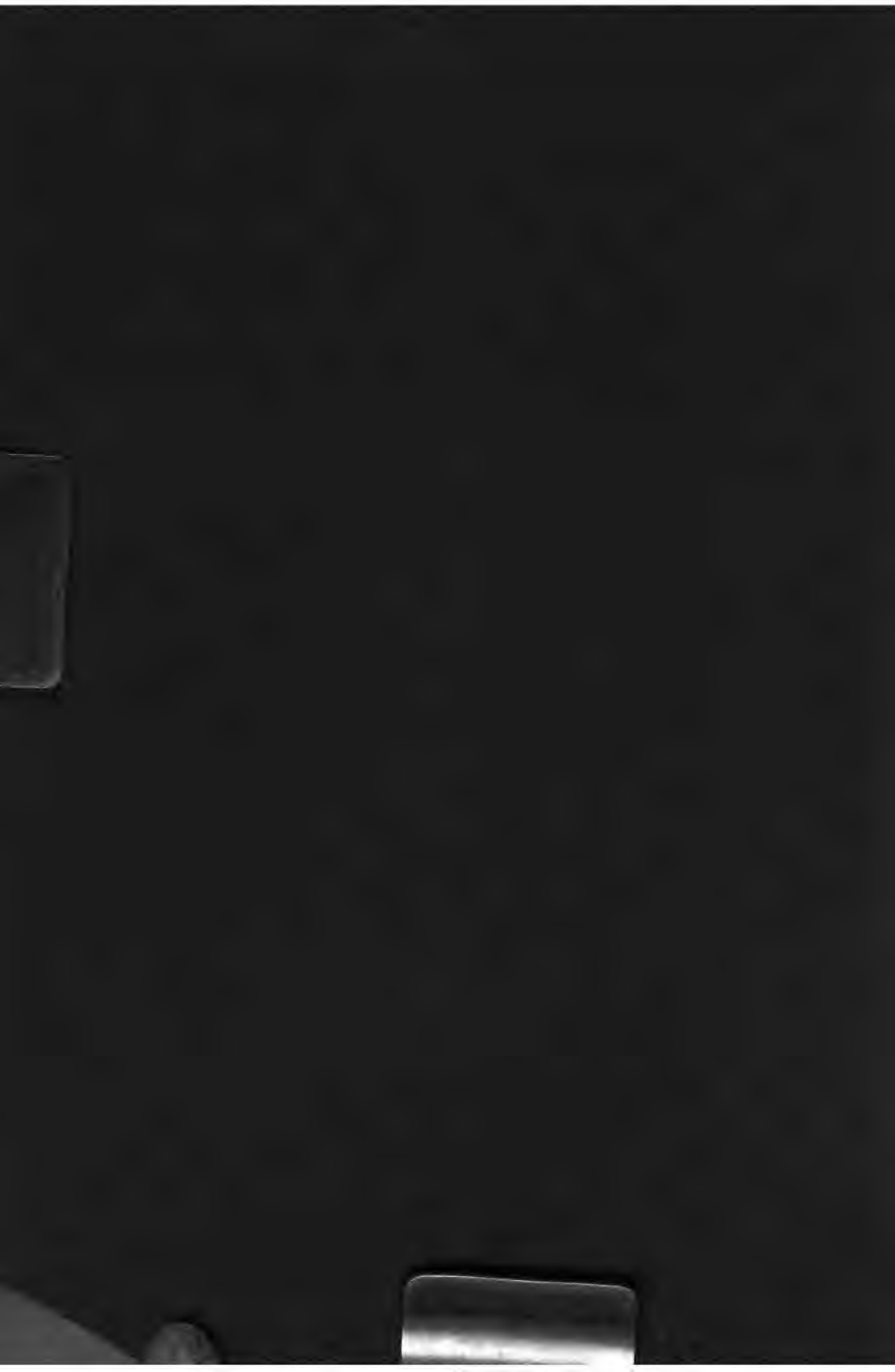
Commissioners of Fisheries



NEW LAKE TROUT HATCHERIES.

Erected at Sturgeon Bay and Sheboygan.

BIENNIAL REPORT

OF THE

Commissioners of Fisheries

OF WISCONSIN

FOR THE

Years 1911 and 1912

MADISON, WIS.
DEMOCRAT PRINTING COMPANY, STATE PRINTER
1912

COMMISSIONERS.

THE GOVERNOR, ex officio.

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GEO. W. PECK ..... Milwaukee

JAMES NEVIN, Superintendent of Fisheries ..... Madison

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LETTER OF TRANSMITTAL.

Hon. Francis E. McGovern,

Governor of Wisconsin.

SIR:—In conformity with law, we have the honor to transmit the biennial report of this department for the fiscal years ending June 30, 1911, and June 30, 1912, respectively.

COMMISSIONERS' REPORT.

The Commissioners of Fisheries present herewith their report on their work during the years 1910–11, 1911–12.

The accompanying report of Superintendent Nevin shows that the work of the Commissioners has been larger in the past two years than ever before. This is true in spite of the fact that rather more than the ordinary number of difficulties were encountered, such as come from unseasonable weather and from low water. The first cause affected the output of bass fry in 1912 and the catch of lake trout eggs. The same cause, coupled with low water, made of little value the reclamation work in the Mississippi. Such hindrances necessarily happen to a work which, like ours, is so dependent on weather conditions, and which is carried on over so wide an area. Usually, however, seasons which are unfavorable for one kind of fish are favorable for others. This has been found true and in general our work has been considerably increased during the biennial period.

The Commissioners have received aid from the United States Bureau of Fisheries, from which we received 20 million whitefish and 2½ million lake trout eggs. The Commissioners wish to extend their thanks to the United States Bureau of Fisheries for this assistance.

The various hatcheries under the control of the Commission are now in good condition. Much repair work has been done in the past two years, especially at the Madison hatchery. At this station some years ago the water supply fell off and it was feared that the supply might become so low as to endanger the work of the hatchery. During this period only the most necessary temporary repairs were made. The water supply, however, increased again to the normal amount and the Commissioners have, therefore, felt warranted in making extensive repairs and improvements. These are described in the report of the Superintendent, as well as the less extensive improvements made at other hatcheries.

The routine work of the Commissioners is well described in the Superintendent's report but there are a few more significant matters, which call for more extended comment. The most important event of the biennial period was the action of the legislature, of 1911, establishing two new hatcheries on Lake Michigan. These were located by the

Commissioners' Report.

Commissioners at Sturgeon Bay and Sheboygan, as stated in the report of Superintendent Nevin. They are now completed and in use, containing about twenty-two million lake trout eggs.

The establishment of these hatcheries is much more than an addition—much more than a large addition—to the plant of the State. They mean that the State has definitely engaged in the duty of collecting all the eggs that can be obtained from the commercial fish in the waters of the Great Lakes under the jurisdiction of Wisconsin; that these eggs will be hatched and the young fry returned to the lakes. This policy of securing and hatching all obtainable eggs is the only one by which the available stock of commercial fish can be increased or even maintained, and Wisconsin is the first state to provide adequate facilities for operations on this extensive scale. The United States Government has maintained and developed the whitefish catch of Lake Erie by a similar policy, but no state government has undertaken so large a work on so large a scale.

Wisconsin has now three first-class hatcheries on the Great Lakes: at Bayfield, Sturgeon Bay, and Sheboygan. Each of these is capable of caring for thirty million, or more, lake trout eggs, or a total of about one hundred million, and the capacity of each hatchery can easily be increased, if necessary. Each can also care for a very great number of whitefish and bluefin eggs. In short, their capacity is ample for the largest possible number of eggs that can be collected. This number will necessarily vary greatly from year to year, A succession of stormy days during the spawning season of any fish will reduce the number. This happened in the fall of 1912, yet we have now in the three hatcheries more than 27 million lake trout eggs, from which we should, under average conditions, obtain twenty million fry. In 1910 and again in 1911 more than ten million lake trout eggs were taken by the employees of the state, and returned at once to the lake after having been fertilized. All such eggs are now brought to the hatcheries and there cared for. There is much less chance of securing young fish from eggs thrown into the lake and exposed to the dangers of being eaten by other fish or of being smothered on the bottom, than from eggs cared for in the hatchery. The commercial fisheries of the lakes will in a few years feel the effect of the increased planting of fry made possible by these new hatcheries.

Under any ordinary conditions of weather, the Commissioners are able to secure a large number of lake trout eggs, but the supply of whitefish eggs is so small that it is insufficient to maintain the fishery; much less to bring it back to its condition in former years. The

Commissioners' Report.

Commissioners have been unable to secure any considerable number of eggs from the United States Bureau of Fisheries, though we have received from that source most of those which we have hatched. This difficulty in securing whitefish eggs is the most considerable hindrance which the Commissioners must overcome in their efforts to improve the conditions of the commercial fisheries of the Great Lakes.

The Commissioners call attention to the experiments of Superintendent Nevin on the effect of planting lake trout fry at different depths. They show conclusively that the young fish will live at all depths in the water where they may be planted. These experiments, although very valuable, are only a small fraction of those which the Commissioners should be able to carry on. They should have funds which will enable them, for instance, to trace the life of the lake trout during its development in the lake; to ascertain its natural food at different ages; the kind of locality in which it best thrives; its normal rate of growth; its size and age when it is ready to spawn; and its normal migrations in the lake. All of this information is necessary if the large work which the state has undertaken for the commercial fisheries is to be carried on intelligently and with the best success. This knowledge cannot be gained from any occasional experiment or observation, made by men whose time is fully occupied with other duties; although valuable points may thus be secured. There is necessary careful and continuous study and experiment, directed to the waters in the same way that the agricultural experiment station investigates the land.

From time to time the Commissioners have coöperated with the Geological and Natural History Survey, giving small amounts of assistance to investigations which that Survey was carrying on and which were of interest to the work of the Commissioners, and also receiving aid from the Survey in investigations which were of immediate importance to them. One such matter is reported elsewhere in this document: a study of a parasitic disease which attacks the brook trout, especially at the Wild Rose Hatchery. Such small investigations are possible out of the funds now at the disposal of the Commissioners, but no such investigations can be carried on as are needed by the fisheries of the Great Lakes. Special action of the legislature will be necessary to make these possible.

Besides the new hatcheries, there has been made one other considerable addition to the working plant of the Commissioners: a new fish car—Badger No. 2—was purchased in 1912. The first fish car was bought in 1893 in consequence of the large amount of work needed for maintaining an exhibit of the fish of the state at the World's Fair in

Chicago. The car has been in constant use since that time. It has traveled annually in distributing fish from 15,000 to 20,000 miles, and is still in good condition and in active service. With the enlargement of the work of the Commissioners and the increase of the number of hatcheries, there came need for enlarging the means of distributing fry. The Commissioners, therefore, purchased, at a cost of $13,500, a modern steel-framed car, which will more than double the facilities for distributing fish and fry. The new car went into service late in the summer of 1912. It is 72 feet long, while the first car was 55 feet. It contains 15 fish tanks, as against 12 in the old car. It is equipped with kitchen, stateroom, etc., for complete service.

Attention is invited to the report of Mr. N. Fasten on the parasitic crustacean which has caused many deaths of the older brook trout kept for breeding. This parasite is found in streams and lakes both in Europe and America. Under natural conditions, it is not ordinarily present in numbers sufficient to do serious harm, but the necessarily crowded conditions of life for fish in breeding ponds offer unusually favorable conditions for its development, and it occasions considerable damage. This is only one of the many similar difficulties which have to be met and overcome in all attempts to "improve nature." It is similar to the diseases, like rust and smut, which attack field crops and work so much damage to the farmer. The commissioners are much indebted to Mr. Fasten for his careful and successful study of the problems which the parasite offers. It is, however, still difficult to suggest a radical cure; a condition which is frequently met with in the case of other such diseases.

The Commissioners wish here, as in former years, to express their thanks to the employees of the State who are engaged in the work of propagating and distributing fish. They recognize the care and faithfulness with which these men have performed their duties. It is peculiarly true of such duties as those offered by the work of the Commissioners of Fisheries, that success can be reached only by a service which is far more than perfunctory, or even routine in its character. The large success of the State in securing and caring for the large number of eggs and rearing fry to be planted in its waters is due in a great measure to the devotion to duty of the men in immediate charge of the work.

In conclusion, the Commissioners desire to express their thanks for the confidence which the State has shown in their work by granting them enlarged plant and income during the past two years. They express also the hope that the State will receive full returns for all

money expended for the purpose of maintaining and increasing the fisheries of the State.

Jabe Alford.
A. L. Osborn.
E. A. Birge.
Jno. C. Burns.
B. C. Wolters.
Jas. O. Davidson
Geo. W. Peck.
Commissioners of Fisheries.

The Brook Trout Disease.

THE BROOK TROUT DISEASE AT WILD ROSE AND OTHER HATCHERIES.

NATHAN FASTEN,

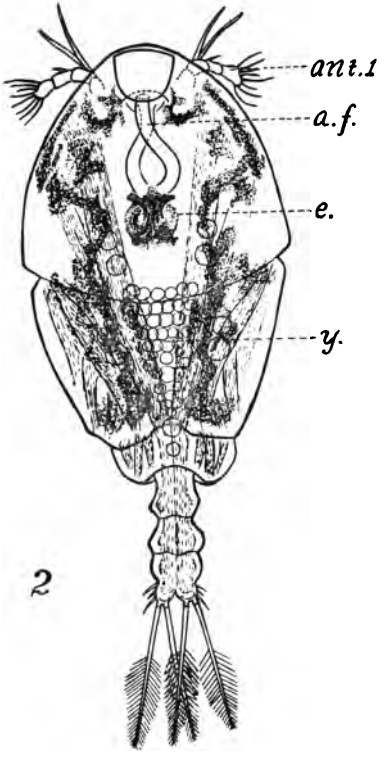
Department of Zoology, The University of Wisconsin.

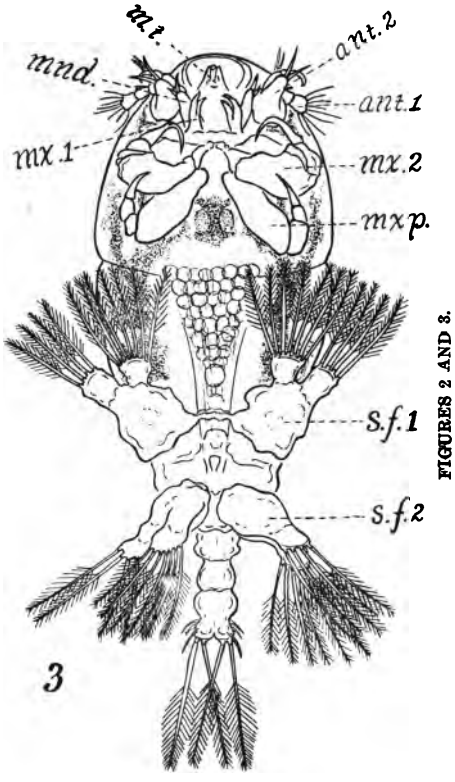
This summer, while in the employ of the Wisconsin Fish Commission the author studied the behavior and life-history of a parasite which is attacking the brook trout in the various trout hatcheries conducted by the Commission. This parasite is a minute crustacean belonging to the group called copepods. Many members of this group are parasitic on fish and have commonly been named "fish-lice." They may attach themselves to many portions of the fish, such as the skin, the fins, the flesh proper, and the gills. The gills, however, are a favorite point of attack, since here the skin is very thin and the blood vessels are numerous and close to the surface. The parasite is also protected by the gill cover from external injury. A parasite therefore finds on the gill ideal conditions for existence: it has at once protection and easy access to abundant nutrition and so can readily obtain the means of carrying on its further development.

The object of the investigations was two-fold: first, to get a complete history of the development and structure of the copepod, and second, means were sought of remedying existing conditions, thereby ridding the streams of the pest, and preventing further loss of trout from this source of infection.

Most time was spent at the Wild Rose hatchery, but various other portions of the state were visited in order to discern how widespread the parasite is within our streams. Visits were made to the Bayfield hatchery, as well as the Madison hatchery. Streams in the vicinity of Wild Rose and Bayfield were examined, and some time was also spent in the western portion of our state in search of the same organism.

In all the above mentioned hatcheries, the copepod was thriving in great abundance. In the vicinity of Wild Rose, the parasite was found on the trout of Pine river, (both upper Pine R., Pine R. creek,





FIGURES 2 AND 3.

The Brook Trout Disease.

and the lower portion of the same stream), Edward Jones' creek, Humphrey creek, Eidelweil pond and Mill pond. The trout of Willow creek were also examined, but although the organism was not found on them, still the appearance of their gills gave the impression that the copepod may be breeding within the stream. At Bayfield, the trout in Birch run and in Pike's creek, the two streams feeding the ponds of the hatchery were found thickly infested with the parasite. In the western portion of the state, the copepod was found thriving in the region of the Kinnickinnic and Willow rivers.

The brook trout, (*Salvelinus fontinalis*), more commonly called the speckled trout is heavily parasitized by this copepod, whose scientific name is *Lernaeopoda edwardsii* (Olsson). This copepod infests this species of trout only; the rainbow trout as well as the German brown trout being entirely free from it. The appearance of the adult parasite is shown in figure 1. The body is sac-like and from its posterior extremity arise two long egg cases that contain the developing embryos. The animal is attached to the gill by two thick arms (mx. 2), that converge toward the gill where they become attached to the chitinous funnel inserted in the filament. Through this structure and the arms the copepod sucks its nutrition from the fish. The length of the parasite's body, exclusive of the egg sacs is about 4 mm. (1/6 inch) while the length of the egg sacs varies from 2 to 3 mm. Egg sacs carrying the first batch of developing embryos are 3 mm. (1/8 inch) long, whereas those that carry the second batch of young are 2 mm. (1/13 inch) long. The arms are 2 1/2 mm. (1/10 inch) in length.—More will be said concerning these structures in our account of the copepod's development, or the so-called "life-history."

The life-history of the organism is very interesting. The copepod hatches into a perfectly developed free-swimming larva, (figs. 2 & 3), in which state its existence is very short, perhaps not more than two days at the most. Its movement is very characteristic, being a snappy, spiral dart. During all this while the mouth parts are incessantly moving, ready to function as soon as the opportunity presents itself.

The organism is minute in size, about 0.73 mm., (1/35 inch) in length, and consists of a head region, thorax and abdomen. The head is broad, elliptical, and bears the mouth parts and a peculiar filament for attachment to the fish. This attachment filament is situated beneath the dorsal covering of the head, and is made up of two parts; (1), a broad mushroom-like spherical body, whose normal position is at the extreme anterior portion of the head, and (2), a tube-like structure, which makes its way backward from the posterior region

of the mushroom body, as far as the eye, and then turns upward in one circular loop, passing underneath the first part of the tube and continues to ascend until it reaches the level of the posterior margin of the mushroom body, where it is attached to the head. The thorax has two segments, and these bear the two swimming feet. The abdomen is slender, and consists of three segments, the last of which is supplied with four long feathered setae. Figures 2 and 3 illustrate, respectively, a dorsal and a ventral view of the free-swimming copepod.

When the animal comes in contact with the gills of the trout, it immediately begins to attach itself. By the aid of the microscope the exact method of fixation was observed. The copepod inserts its mouth parts into the flesh of the gill, and by means of its powerful, claw-like second maxillae it rasps the filament until it forms a cavity within it. As soon as this occurs, the anterior portion of the head of the copepod is brought in contact with the cavity, and the enclosed attachment filament is inserted into the newly formed hole. The broad mushroom body of the filament adheres to the flesh, and the regenerating tissue of the gill soon encloses it firmly. In this condition, the parasite remains attached for a short time. Then the second maxillae detach the posterior part of the attachment filament from the margin of the head, and themselves become permanently attached to the filament's posterior end.

From now on the parasite does not have to struggle for its existence. It has everything it needs to carry on its further development. All that the animal has to do is to passively hang on the gill filament and partake of the abundance of nourishment brought to it by the circulating blood of the fish. The swimming feet and the mouth parts are of no further use to the copepod in this passive state and they degenerate. In fact the entire animal undergoes degeneration and changes considerably. The mushroom body of the attachment filament hardens into a chitinous funnel-shaped structure. The body itself grows enormously in size, becoming broad and sac-like in appearance. It loses all traces of segmentation, and becomes nothing more than a storehouse for the developing eggs of the parasite. In two weeks time the copepod has assumed its adult appearance.

The sexes can now be distinguished. The male is much smaller in size than the female and is farther distinguished by two characteristic streaks of dorso-lateral markings which are absent in the female. Copulation generally occurs about two and a half or three weeks after attachment. In order to effect copulation, the male releases its hold on the gill and attaches itself to the posterior margin of the female's

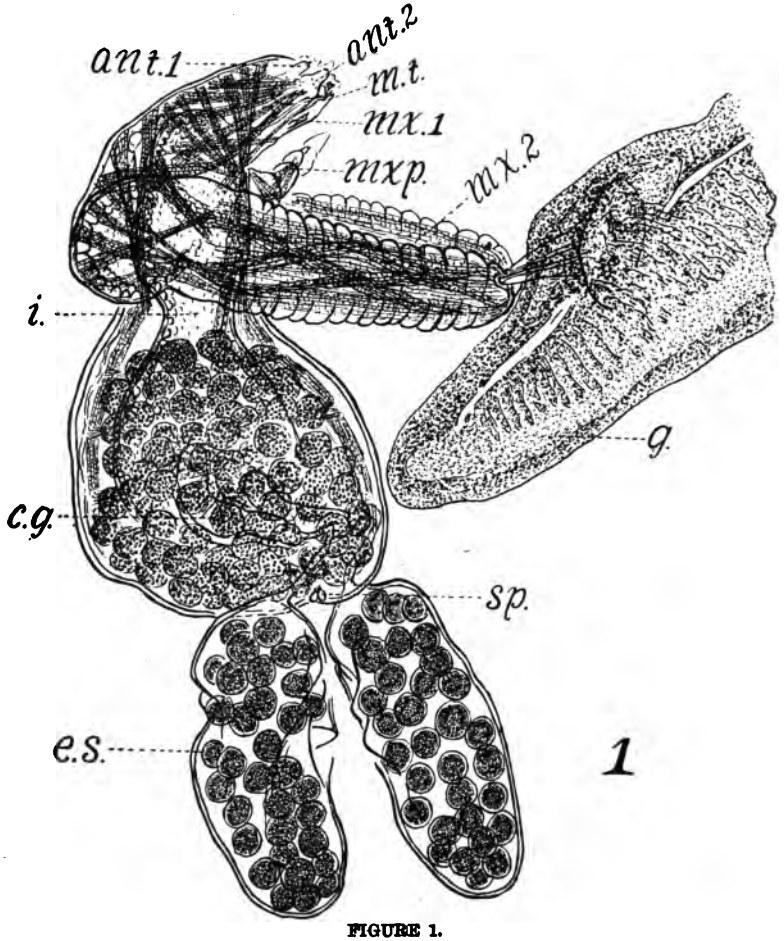


FIGURE 1.

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body. Soon after fertilization the male dies, while the female continues the life-cycle. Her body increases enormously in size and eggs make their appearance in the ovaries between the intestine and the body wall. Outpocketings now develop on each side of the posterior portion of the body, forming receptacles for the fertilized embryos. (Fig. 1, e. s.). Within these cases the embryo completes its development in about three weeks or a month at the most.

Each female gives rise to two batches of larvae. The first batch consists of about one hundred and twenty embryos, sixty in each egg sac. During the period of development of these embryos, the second batch remains intact within the body of the copepod. (See Figure 1). When finally all of the embryos have been liberated from the female, the life-cycle is completed. She now dies and ultimately deteriorates on the gill of the fish, thereby causing the deterioration of the gill filament which eventually causes the death of the trout. As already stated, it takes about three weeks or a month at the most for each batch of embryos to develop. The first batch of eggs make their appearance about three weeks after attachment. Taking all these periods into consideration it is seen that the complete life-cycle covers a period of some two and a half months. Figure 4 is a photograph of a number of isolated gill arches with adult copepods attached to their filaments. The egg sacs are clearly seen in many of the parasites. Figure 1 gives a more detailed picture of the structure of an adult female. The first batch of eggs have already begun to make their escape from the broken egg cases, whereas the second batch of eggs are seen within the large bag-like body.

The fry, as well as the adult trout are infested by the copepod. The adult brook trout, however, are the chief sufferers. These are attacked by such numbers of the parasite that they are ultimately killed. As many as two hundred and fifty copepods were picked off from one adult brook trout. The injury produced in such cases is very great. The blood of the host is removed in enormous quantities. The fish is thereby deprived of nourishment, and is literally being starved. Then again, whenever the parasite attaches itself to the gill filament it pierces the flesh and this causes the injured portion to swell and thicken. A lot of scar tissue thus develops which greatly interferes with the gill in properly performing its functon of respiration. Besides, the copepod is often the cause of many of the secondary infections of the trout. As already stated, the parasite in attaching itself wounds the gill or other parts of the fish's body. Bacteria and spores which are always found abundantly in natural streams, may easily make

their way into these injured portions and thereby set up infections of a serious nature. The author has often seen fungous growth on trout parasitized by the copepod. Taking all these facts into consideration there is little wonder that the fish succumb under the attacks of so many of the parasites. Shortly before death the fish seem to be very weak, the parasites having sapped all the vitality out of them. Some lie very quietly at the bottom of the ponds until death, while others wabble feebly about, their gills becoming distended enormously and the color of their body changing to a pallid tinge. The latter generally made their way to the regions of the pond bedecked with alga and there died.

Trout that are parasitized by few of the copepods are in no danger whatsoever. The pest becomes serious only when it attacks the trout in large numbers. A parallel might be drawn between the copepod's parasitism and that of lice on chickens. A few lice will not in the least interfere with the well-being of the fowls; many of them, however, soon sap the vitality out of even the strongest birds. Figure 5 is a picture of the heads of two adult trout, about three years old, with the copepods attached to their gills.

At the Wild Rose hatchery, the loss of trout has been most pronounced during the spawning season. I do not think that this is caused by an increase in the number of copepods during this season of the year. The increased death rate must be attributed to the weak condition of the fish, during and after the spawning period. The spawning season is a great drain on the energy of the trout. All of the tissues are called upon to contribute to the ripening of the reproductive organs. The activities of the fish are increased, but they do not feed as abundantly as usual. Besides, in the hatcheries, the trout are stripped of their eggs and this necessitates a handling of the fish. All these facts tend to lower their vitality considerably. The fish is now in no condition to resist the attacks of an ordinary number of copepods, for it is weaker than usual, and hence the death rate during this period increases enormously.

As has already been stated, this parasitic organism is found to be widespread throughout the trout streams of our state. It also has been recorded in other portions of the globe, in Canada and in Europe. In all probability, therefore, the copepod has been in our streams from time immemorial. For anyone to claim that the parasite was bred in our hatcheries and then distributed throughout the state, would be to close one's eyes to the facts in the case. Rather the opposite is true; the copepod, undoubtedly, was found in our waters, where there

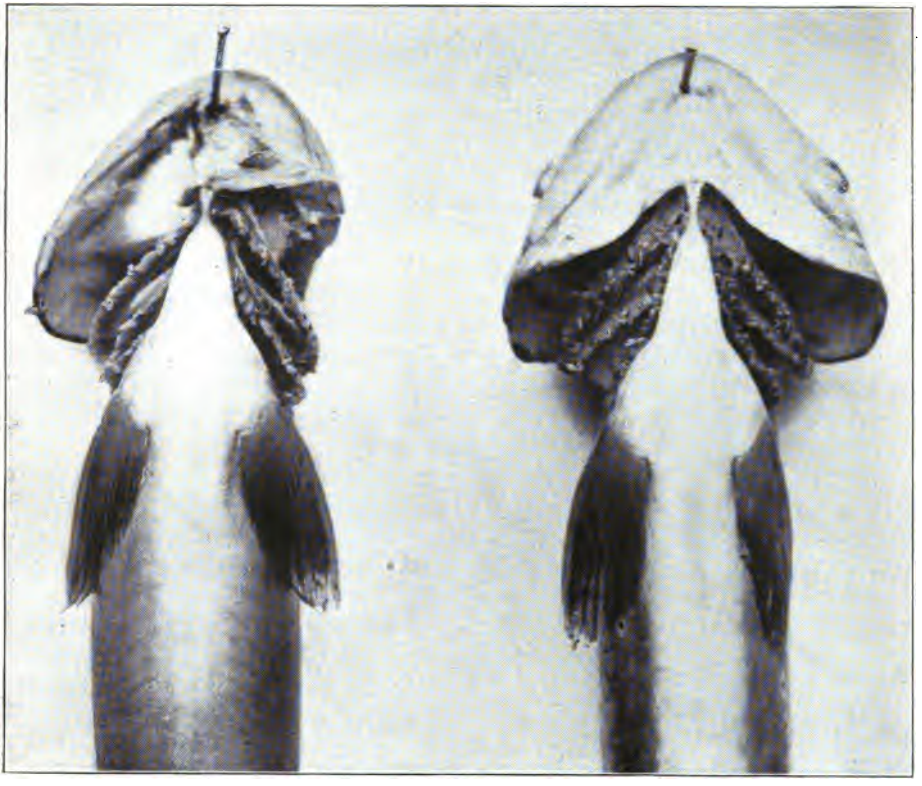


FIGURE 5.

The Brook Trout Disease.

were brook trout, long before the existence of the hatcheries, and it was introduced into the latter with the introduction of the wild trout. There also is the possibility, however, that the parasite found its way into our hatcheries with the bringing of brook trout raised in other states of the country.

While at Wild Rose, Mr. Wm. Wood, supervisor of Mr. B. K. Miller's estate, situated a few miles from the hatchery, has disclosed facts to me which tend to show that the copepod was prevalent in the Wild Rose streams long before the hatchery was erected. Mr. Wood told me that about twenty-four years ago, he operated a private trout hatchery on Pine river. He secured adult brook trout from that stream and closed them up in his ponds for breeding purposes. Very shortly after this, he found that his fish were beginning to die off rapidly, and on examining them he found them to be suffering from "gill trouble". On questioning Mr. Wood more closely concerning the trouble, it became evident that the dying off of his fish was caused by an organism similar to that which is now thriving in our own hatcheries. Of course, this cannot be made as an absolutely positive statement, for Mr. Wood has no drawings, nor any preserved specimens of these organisms of an earlier day. When I made a crude sketch of an adult copepod, Mr. Wood immediately recognized it, saying "That's the bug". When the Wild Rose hatchery was first constructed, the Commission also caught wild brook trout from Pine river and placed them in the hatchery for breeding purposes. It may be that the parasite was thereby introduced into the hatchery. It is also very likely that the copepod may have been brought in with the trout shipped to Wild Rose from our other hatcheries.

In the natural streams the parasite is not at all dangerous. Here the copepod's struggle for existence is so severe that very few of the hatched organisms get the opportunity of coming in contact with the host needed to complete the life-history. Let us for instance consider the conditions in such a stream as a swiftly running brook, which affords a favorable haunt for trout. The stream extends for many miles, thereby giving the fish ample room to move about. There is, therefore, no congestion, and if there happen to be any parasitized fish in the stream, these are generally so far apart from most of the other trout that there is little fear of spreading the infection. Then again, the current is swift, and most of the hatched copepods are quickly carried off. Since the life of the free-swimming parasites is very short, two days at the most, the chances are that the greatest majority of them die before ever coming in contact with a host. On

The Brook Trout Disease.

that account trout in their native haunts are but little infected, and the death rate amongst them from this source of infection, must therefore be an almost negligible quantity. On the other hand, conditions in the hatchery are very favorable for the rapid spread of any disease. Here, a great many trout are confined in a small area. As soon as the copepod hatches from the gill of a parasitized fish, it has hundreds of trout within its immediate vicinity that afford it hosts for attachment. Besides, the current within the pond is rather slow, and does not at all impede the movement of the parasitic organism. The copepod here has conditions almost ideal for its propagation. It therefore is only a short time before most of the trout in the hatchery are heavily parasitized, and ultimately killed by the copepod.

The question arises, "How can existing conditions be remedied?" While at Wild Rose the greater portion of the author's time was devoted to this problem, which, from the economic side is a very important one. The investigations in this direction were two-fold: first, an effective means was sought of ridding the ponds of the free-swimming larval forms, and second, a remedy was sought that would kill the adult copepods on the gills of the fish, and which, at the same time, would produce little or no injury to the host itself. Of course, the latter remedy would prove the most satisfactory, were it possible; but along this line of experimentation little success was reached.

The copepod, when once it makes its hold on the gills, develops a thick, fibrous, and very tough integument, which is hard to penetrate, and which is little affected by powerful solutions of salts. Solutions of copper sulphate, potassium chlorate, sodium chloride, and mixtures of sodium chloride and potassium chlorate were tried, but these had no effect on the parasite. Trout will live about half an hour in an aqueous solution of copper sulphate, made by adding three pails of copper sulphate crystals to ninety pails of water having a temperature of 52° F. When the fish are removed from the solution shortly before the half hour, and are allowed to recuperate in running fresh water, an examination of the gills shows that the copepod has not been affected in the least.

A one per cent solution of potassium chlorate has no effect on the attached parasite. In this solution, however, trout will live for more than twelve hours. A two per cent solution of the same chemical gave similar results. Trout thrived in this mixture about the same length of time as in the one per cent solution. The solutions were made by respectively dissolving one and two pails of the crystallized potassium chlorate in one hundred pails of water having a temperature of 52° F.

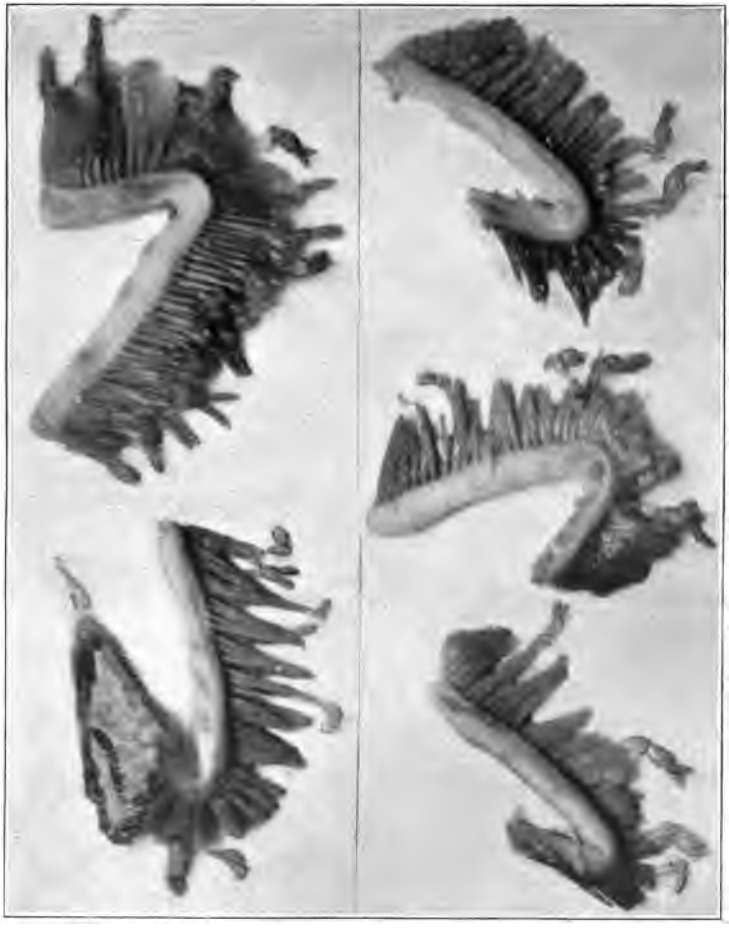


FIGURE 4.

The Brook Trout Disease.

Sodium chloride, at first glance, seemed to be very effective. Trout can live about ten hours in a two and a half per cent solution of sodium chloride, (made by dissolving two pails of salt in eighty pails of water having a temperature of 53° F.) When the gills of the fish are examined immediately after death, one cannot discern any movement of the parasitic organisms. Ordinarily, the copepods wiggle about for a considerable length of time after the fish has died. The sodium chloride seems to stupefy them, and this easily misleads one into the belief that they have been killed. However, if the fish are removed from the solution shortly before death, and are allowed to recuperate in running fresh water, the copepod revive from their dormant state. It is thereby seen that the salt does not kill the adult copepods. The very young adults, those about a week old, on the other hand, are killed in this solution. A three per cent solution, as well as a five per cent solution brought no results. Trout live in the former mixture about three hours, whereas in the latter solution they thrive about an hour. The copepod is not injured by the chemicals.

In a solution containing one hundred parts of water, three parts of sodium chloride, and one part of potassium chlorate, at a temperature of 52° F. trout live, on an average, from two and a half to three hours. But the mixture does not kill the copepod.

In all the above experiments controls were kept, and it was found that in fresh water which is allowed to go stale, trout will live about twelve hours.

From these results it must be concluded that it is almost futile to attempt to eradicate the copepod while it is attached to the gills. No remedy has been found that will exterminate the parasite while thus attached and, at the same time, not kill the trout. A remedy that is to be effective, obviously must destroy the parasitic organism but not the host.

When the copepod is in its free-swimming stage of existence it can easily be killed. In this period of its life-cycle, the organism is minute in size; it swims about actively in search of a host, and lives, at the most, about forty-eight hours. It does not feed during this period, being supplied with a limited amount of embryonic yolk which it utilizes as food. Its texture is frail and non-resistant; it is therefore easily injured by pressure, temperature, and various chemicals. The following is a list of solutions that have effectively killed the organism:

1. sodium chloride, (1.2% and over).
2. 0.2% potassium chlorate.
3. 0.2% copper sulphate.
4. 9% hydrogen peroxide.

5. 1.7% magnesium sulphate.
6. 0.85% calcium chloride.
7. 0.08% hydrochloric acid.
8. 0.03% nitric acid.
9. 0.015% sulphuric acid.
10. 0.1% acetic acid.
11. 0.45% tartaric acid.
12. 0.3% oxalic acid.

But how can the fish be cured? When all the facts are taken into consideration the difficulty is not so great as it might appear at first sight. It has been seen that the free-swimming organism is easily killed by very weak solutions of sodium chloride, potassium chlorate and the like. The fish, on the other hand, can thrive quite well in an aqueous mixture of two and a half per cent sodium chloride, or a one per cent or two per cent mixture of potassium chlorate, as was observed in the foregoing discussion. The chemical seems to affect the fish but little, and if there were a circulating solution of it the trout, in all probability would thrive almost as well in the chemical mixture as in the circulating water. This fact makes a remedy possible.

One must catch the hatching copepods as they break out of the egg cases and kill them then. The period of development of the copepod lasts about two and a half months. Generally, an infected fish contains copepods in different stages of development. These infected fish must be removed from the hatchery streams and be placed into ponds that are supplied with the chemical solutions. For this purpose, special ponds will have to be built. The regular ponds in such hatcheries as those at Wild Rose are ill adapted for the purpose for they contain bubbling springs which will prove a serious stumbling block if an attempt is made to use them for curing the fish.

The trout should be kept in the "curing ponds" for a period of about three months. During this entire period a circulating flow of either the sodium chloride or the potassium chlorate solution should be constantly maintained within them. This might best be done in the following way. Tanks containing enough of the chemical solution should be erected near the "curing ponds", in order to supply the latter with curative mixture. All of the fluid flowing from these ponds should be collected and conducted back again into the tanks. If the solutions are kept well aerated, they can be fed over and over again into the ponds without serious damage to the trout. Circulating flows of the chemical could thus be maintained without very much trouble and at a small expense. Eventually, all the hatching copepods would be killed off, and the fish would be entirely free from the pest. In the meantime, the hatchery ponds would also rid themselves of the copepod, since they did not contain infected fish for so long a period.

The Brook Trout Disease.

Another means of removing the copepods from the waters of the ponds would involve the destruction of all parasitized trout, and the restocking of the ponds with fish that are free from disease. This destruction of infected trout should be done after the spawning season, so that at least the spawn can be obtained from them. The eggs should then be shipped to a clean hatchery for development. In the meantime, all operations at the infected hatchery ought to be suspended, and the ponds drawn down, scraped, and allowed to remain in this dormant condition a couple of months. In a very short while the waters would rid themselves of all the free-swimming larval forms. Then the ponds could be restocked with healthy trout.

From an economic point of view, this last proposed means of eradicating the copepod would be the most advisable one to try. While from a scientific standpoint it might be very interesting to try to cure the fish, this would involve so great an expenditure of money as to render the method impractical. In the first place, new ponds would have to be built. Then again, circulating flows of the chosen chemical mixture would have to be constantly maintained within them. This would mean that tanks of these solutions would always have to be kept on hand. Expensive machinery would have to be installed for the purpose of supplying the solutions with oxygen, so that they could be fed over again into the ponds. Furthermore, men would have to be employed to look after the entire process of curing the fish. All these things would involve a vast expenditure of money, and on that account the proposed plan would hardly be worth while.

In those hatcheries where the source of water supply is polluted, as at the Bayfield hatchery, the problem of eradication is a more difficult one. The above methods would probably not be effective, for the water feeding the hatchery would be constantly bringing in a new batch of larval forms, thereby infecting any speckled trout placed in the ponds. The only efficient remedy would be to change the water supply, and to restock the hatchery ponds with clean fish. But if this cannot be done, a large percentage of the copepods could be gotten rid of by taking the following precautions:

1. The installation of fine sand filters at the mouth of the water supply, as it makes its entrance into the hatchery ponds. The sand would catch most of the copepods before they enter the ponds, thereby preventing a great deal of infection.

2. The young fry ought to be given salt baths quite often. This kills the adult copepods during the early stages of attachment. The salt also makes the fish more resistant.

3. Since the adult trout are the ones most heavily parasitized, it would be a great saving if these fish were all gotten rid of, and only two-year old trout utilized for spawning purposes. This would mean that after spawning, the trout are to be immediately shipped from the hatchery, and that the next season the spawn is to be secured from other two-year olds which have been developed in the meantime.

4. Since *Lernaeopoda edwardsii* is very strongly positive to intense light, powerful electric arc lights ought to be erected at various points over the ponds, so as to attract the organism. By means of fine gauze bags towed over the illuminated region, the gathered copepods could be removed. Many parasites could thus be gotten rid of.

Although these precautions may not entirely rid the ponds of the copepods, still they would tend to minimize the loss from the organism enormously. The first two of these precautions I regard of the utmost importance in ridding the ponds of the parasite. The first of these, the installation of sand filters, cannot be too strongly emphasized. The sand particles would catch the copepods and thereby prevent them from ever reaching the trout.

My sincere thanks are due to the Commissioners of Fisheries and their employes, especially Mr. Zalsman of the Wild Rose hatchery for many courtesies shown me. To Professors E. A. Birge, M. F. Guyer, and George Wagner I wish to express my deep appreciation for their help and interest in the progress of the investigations. I also wish to thank Prof. C. B. Wilson for his identification of the copepod.

Explanation of Figures.
abbreviations.

a. f.	= attachment filament.
ant. 1	= first antennae.
ant. 2	= second antennae.
c. g.	= cement gland.
e.	= x-shaped eye.
e. s.	= egg cases (or sacs).
g.	= gill.
i.	= intestine.
mnd.	= mandibles.
m. t.	= mouth tube.
mx. 1	= first maxillae.
mx. 2	= second maxillae.
mxp.	= maxillipeds.
s. f. 1	= first pair of swimming feet.
s. f. 2	= second pair of swimming feet.
sp.	= spermatophores.
y.	= yolk.

PLATE I.

Figure 1. *Lernaeopoda edwardsii.* Adult female attached to the gill, containing the first and second batches of eggs.
Figure 2. *Lernaeop da edwardsii.* Dorsal view of free-swimming copepod.
Figure 3. *Lernaeopoda edwardsii.* Ventral view of free-swimming copepod.

PLATE II.

Figure 4. Isolated gill arches with attached adult copepods.
Figure 5. Heads of brook trout heavily parasitized by the copepod.

Superintendent's Report.

SUPERINTENDENT'S REPORT.

To the Commissioners of Fisheries of Wisconsin.

Gentlemen:—Hunting and fishing are acknowledged to be the most ancient industries of man. These pursuits had much to do with the settlement of our wild lands. In new lands settlements are first made in close proximity to the lakes and rivers as here could be found an abundance of game and fish food, and the settler was sure of his daily maintenance. The fish were caught in a primitive manner, either in traps made of brush or with a forked stick in the shallow water. To navigate the waters rafts or dug-outs were made. Many of us can remember the days when almost every family had a barrel of salt fish for winter use. With the present method of refrigeration in vogue, very few fish are now salted. Every commercial fisherman has his ice house which is filled in winter so that he may have ice to preserve his fish until placed on the market. The herring is now the only fish salted in Wisconsin for the market. Approximately 40,000 packages weighing 100 pounds each, are salted by the commercial fishermen working on the waters of Green Bay and Lake Superior.

In former days commercial fishing was done with gill nets and large seines. Pound nets are the most destructive in catching the finny tribe. The mesh in the pots of the pound nets is so small that hundreds of tons of undersize fish were caught, and being of no value to the fishermen, they were carted to the dumping grounds. In those days the fishermen used sailboats, and any block of wood or stone would serve as a float or sinker. To-day the commercial fishermen have steam or gasoline tugs, and their nets are fitted with alumina corks and with lead sinkers.

In the early days our waters abounded with fish life, but as civilization advanced man slowly proceeded to kill the goose that laid the golden egg. It is only within recent years that much attention was given to the protection of fish and to the maintenance or increase of our natural supply of food fishes. This is now considered most important by all states and governments. Laws have been enacted

covering most phases of fish protection and vast sums of money are appropriated annually for the establishment of hatcheries to supply young fish for planting in the lakes and streams, thus maintaining the supply of fish for future generations.

COMMERCIAL FISHERIES.

Modern methods of refrigeration have vastly improved the handling of fresh fish. In inland towns where fresh fish were an unknown luxury, the choicest varieties are now available at all times. It has frequently been stated that the commercial fishing industry is diminishing every year. This statement is incorrect, although it is true that the salt fish trade has greatly decreased since fresh fish are found on all the markets. More fish have been caught in recent years than at any time in the history of the commercial fishing industry. This industry in Wisconsin may be said to include the waters of lakes Superior, Michigan, Green Bay and the Mississippi river. It gives employment to 1400 men and approximately $622,000.00 is invested in boats, nets and other equipment. During the eight years from 1903 to 1911 statistics show an increase over 1903 of 8,797,470 pounds of fish marketed and an increase of $550,590.00 in the market value; showing the industry to be well worthy of attention.

OUTLYING WATERS.

For a number of years the size of mesh to be used in outlying waters has been a matter of contention among the fishermen. This is a very important question. The larger the mesh used the better the quality of fish caught and the more marketable the catch, as the fish are larger and of more uniform size. The smaller the mesh the smaller the fish caught, and being undersize bring a lower price. The ultimate result is that the waters are being rapidly depleted of undersized fish. This gives them no opportunity to reach the spawning age for natural reproduction.

Nets of suitable size that are adapted to one portion of the lake may not be the proper size for other localities, and there is a continual clash with the fishermen during every legislative session as to what size mesh should be used in the nets of commercial fishermen. Thousands of undersized fish are caught every year. If these fish were given an opportunity to mature, and the fishermen could agree upon a uniform size mesh, it would be a matter of only a few years when their business would increase ten-fold. Nothing less than a 2¾ inch

mesh gill net should be allowed to be set for commercial purposes in any of our outlying waters.

TRESPASSING.

The state expends a large sum of money every year to stock our streams, and the right of the public to fish in them should be secured as far as possible. The right to share in the benefits of the state work should not be monopolized by riparian owners. This is a delicate subject, especially when the old rule obtains that the riparian owner has the exclusive right to take fish on his own soil. It is held that he cannot be divested of this right by legislation. From those who will not accord the public this right to the streams on his soil stocking by the state should be withheld as much as possible. This is almost impossible, as one farmer may be willing to allow the people to fish on his land while his neighbor above and below may refuse. The public-spirited farmer applies for fry and plants them in the stream; but the fish, being bound to no spot or place, pass up or down the stream.

Most of our best streams pass through wild and unbroken lands where the public is allowed to fish at will. Some of the land owners make a business of charging fifty cents or a dollar for the right to fish on their lands, but these instances are rare.

STEELHEAD TROUT.

Some years ago the U. S. Bureau of Fisheries planted steelhead trout in some of the streams tributary to the Great Lakes, and the past several years have shown results from these plantings. Quite a number of the fish have been caught in lakes Superior and Michigan. At Port Washington, Wisconsin, the firm of Smith Brothers, commercial fishermen, report catches of steelhead as high as 100 pounds in a lift of their pound nets. It is to be hoped that the steelhead trout will become of great commercial value.

This fish ascends the rivers in the spring to spawn and then returns to the lakes. We shall endeavor to collect a quantity of the eggs during the spawning season of 1913, if they can be caught in sufficient number to warrant the expense.

STURGEON.

During the coming season the Commission will take up the propagation of sturgeon. I believe that a sufficient number of these fish can

Superintendent's Report.

be secured from the Wolf river near Shawano, to warrant the expense of culture. The sturgeon, that at one time was very common in the waters of Green Bay, and Lake Winnebago, to-day brings the highest price of any of our fresh water fish. In early days these fish were caught in untold numbers and piled on the shores like so much cordwood. As to the propagation of sturgeon little or nothing has been done except in the way of experiments, but we know that the fish can be artifically hatched. On account of their immense size they are unwieldy and difficult to handle for spawning purposes.

WHITE BASS.

With the extra distribution car now available we should be able, next summer, to make a distribution of white bass from the Wolf river where they can be caught in untold numbers. The white bass planted in some of our lakes years ago have done remarkably well. This work will be taken up and pressed with vigor. The white bass is a fine game and food fish, and there is no reason why it should not be introduced into most of our inland lakes.

BLACK BASS.

The hatch of black bass at both the Minocqua and Delafield hatcheries was not the success that we anticipated. In the ponds at Delafield we had 500 pair of as fine breeding bass as could be found. From this station we distributed only 53,000 bass fry and 5,550 fingerling.

From Minocqua we shipped 172,000 bass fry. At this station we had 175 nests in Bass lake on June fourth. On June tenth the temperature dropped 7 degrees Fahrenheit and killed all the eggs on the nests. From these 175 nests where the mature bass had spawned in their natural habitat, we did not secure one fish for distribution. The rock bass nests in the lake met with the same fate. This is the first time we have experienced such failure in our bass propagation.

I am of the opinion that this loss of bass eggs on the nests was prevalent throughout the state. When we went to the Mississippi river to make our annual collection of fish from the backwaters, the entire catch of bass consisted of only 4,500 fish, a number usually caught by three men in one day.

FISHWAYS.

From May fourth to June second, 1912, a period of thirty days, we made a thorough test of the fishway question at four locations in the state where conditions were ideal for the experiment.

Superintendent's Report.

At the Eureka dam on the Fox river but seven suckers passed through the fishway. This is a government fishway of most modern construction. At the Weyauwega dam on the Wolf river four suckers ascended the fishway. At both the Kilbourn dam on the Wisconsin and the St. Croix Falls dam on the St. Croix river no fish made use of the fishways. This bears out my contention that a fishway is of no benefit as to game fish ascending the rivers, and I would recommend that all fishway legislation be repealed.

These tests are absolute. We have sworn affidavits from each of the four men who had charge of the work.

MISSISSIPPI RIVER.

The license money paid by the commercial fishermen on the Mississippi river creates a separate fund used for the rescue of fish from the sloughs and bayous adjacent to the river. (Ch. 428, laws of 1909).

During the summer of 1912 very few fish were found in the backwaters, not enough to warrant the expense of rescuing what few could be found. Very few bass were in the bayous, the bulk of fish caught were crappie and bullhead. At an expense of $1,513.72 a total of 388,877 fish were rescued and all placed back in the main channel of the river.

On December 1, 1912, the fund contained $5,101.54 and when the time arrives again to do this work we should have about $8,000 on hand. During the past summer several persons on the river were of the opinion that this money should have been spent for the simple reason that we had it to spend. However, we have had charge of this work for the past twenty years and our experience has taught us when conditions would warrant our disbursing this fund. Should conditions be favorable during the season of 1913 we shall have the money available to do splendid work when we know that great benefit can be derived and the fund well spent. To have continued the work during the past season would have meant just that much money thrown away.

PLANTING LAKE TROUT FRY.

Complaints have come to this department that it is a mistake to plant fry in deep water, as the small fish cannot survive the pressure of water and consequently perish. To secure some conclusive evidence we conducted the following experiment in the waters of Chequamegon Bay opposite the Bayfield Hatchery.

We constructed perforated cans two feet in diameter and two feet

deep. In each can we placed 500 lake trout fry and suspended them in the waters of the bay the following depths; 20 feet, 40 feet, 80 feet and 120 feet. The cans were anchored and bouyed so that the fry could be easily examined at periods of seven days. In the can at 20 feet the fry were in splendid condition and had thrived wonderfully. This is undoubtedly accounted for by the fact that within 20 feet the water contained ample animal life to sustain the fry. In the other cans the condition of the fry was about the same, but at the end of a seven week test they had starved at death.

I know of no previous experiment of this nature ever having been tried, and it proves conclusively that the pressure of water up to 120 feet has no apparent effect upon the small fry.

LOSS OF FISH.

Every year large numbers of fish perish in our nothern lakes during the winter months on account of the heavy freeze of ice. The winter of 1911–1912 was unusually cold and a great many muskellunge, pike and bass were lost for want of sufficient air in the water. The lakes and streams being covered with ice, the water becomes foul and stagnant for want of aeration. During the summer months the winds disturb the waters, thus supplying the necessary oxygen.

The deputy game warden located at Hammond, Wisconsin, mentioned to me a peculiar loss of fish in a small lake some 25 acres in extent, and which is located on his father's farm. About 20 years ago the lake was stocked with pike, and the fish thrived wonderfully. At the end of the seventh winter, after the ice went out, quantities of pike, many weighing 6 and 7 pounds, were found dead along the shores, and the stench of decaying fish was so bad that a furrow was plowed around the lake and the fish buried. The lake was stocked three different times, and always after a period of seven years the same loss of fish was experienced. This lake has an average depth of 20 feet and has a mud and gravel bottom. During the winter when the farmers are cutting ice, for the summer supply, the fish will come to the holes where the men are working, and seek for air.

During the months of June and July, 1911 the weather was sultry with very little wind. Quantities of pike and other fish were found dead in the waters of Green Bay and Lake Winnebago. In Green Bay the fish were found all along the shores as far north as Idlewild, a distance of some 35 miles north of Green Bay City.

Lake Winnebago and tributaries constitute one of the greatest natural breeding grounds of fish in this country. This district has an

MADISON HATCHERY, DANE COUNTY.

Superintendent's Report.

abundance of pure, fresh water supplied by the Fox and Wolf rivers and many smaller streams. Along these waters are found thousands of acres of marshland, ideal spawning places for the parent fish. The waters also produce billions of small crustacea, which are a food for the fry as soon as they are hatched. Many of our inland waters do not produce the natural food necessary in the early stages of fish life. I find that hard water will produce more animal life than soft water. This is one reason why the lakes in the southern portion of the state will stand more constant fishing, and produce more fish to the number of fishermen than the lakes in the north.

Lake Winnebago is a great feeder for the commercial fishermen of Green Bay. I used to wonder where all the fish came from that were caught at the mouth of the Fox river in Green Bay, and how the bay could stand the constant drain of fish taken annually from the waters in that vicinity. Having occasion to visit the Neenah dam at different times, I noticed the millions of perch, pickerel, pike, black and white bass going over the dam and down the river to Green Bay, and I could readily understand the source of supply.

As is to be expected, we have some fishermen who have no care for the future and who consequently lack interest in the enactment and enforcement of laws which help to maintain the supply of food fish for the generations to come. The great bulk of the Wisconsin commercial fisheries consists of lake trout, herring, chub, and bluefin. More whitefish were caught in the waters of Green Bay during the season of 1911 than at any time during the past twenty years.

The demand for fry to stock our inland lakes and streams is growing every year. During the season of 1912 we distributed more game fish than in any year of the history of this department. A total of 202,248,302 fry were planted in Wisconsin waters, and it required the use of 10,569 ten-gallon cans to transport this immense number of fish.

MADISON HATCHERY.

During the summers of 1910, 1911 and 1912 we expended the sum of $3,920.69 on concrete construction. We built 2622 lineal feet of pond and raceway walls, a total of 583 cubic yards, at an approximate cost of $5.80 per yard. We also laid 1208 lineal feet of 5 foot walk at a cost of 9 cents per square foot, the price in the city being 11 and 12 cents. I find that we made a saving over contract prices of about $1,200.00 in the cement work. Estimates from Madison contractors averaged $6.75 (as compared with $5.80) per yard for the walls, and this estimate did not include the extra hauling of four miles to the

Superintendent's Report.

hatchery, boarding men on the grounds and the extra expense of working in water. Their estimate of $6.75 was based on work as in the city on high, dry ground.

All the ponds have been practically rebuilt; and with the exception of the hatchery buildings and dwelling houses which are in need of painting, this station now presents a very good appearance.

BAYFIELD HATCHERY.

The new pipe line from Birch Run dam to the hatchery has been completed. The exchange of land with Mr. Sykes has been consummated in a satisfactory manner and all the papers have been filed with the secretary of state. As directed by the Commission two acres of land were also purchased of the Pike estate.

Three new cement fry tanks were built at this station, and ten new hatching troughs were installed. Birch Run dam has been thoroughly repaired and the entire plant is now in excellent condition.

MINOCQUA HATCHERY.

The dam across the thoroughfare has been completed and the new bass pond thus formed will be in full operation during the spring of 1913. The dam was erected at an approximate cost of $2,500.00, some $500.00 below the original estimated cost. A new cement fry tank was built alongside the hatch house.

Owing to the insufficient supply of water furnished through the five inch pipe it was necessary to install 200 feet of eight inch vitrified pipe which now gives us an ample flow of water into the hatchery. To expedite the draining of, and the sorting of fish in the large bass pond, a new outlet was built below the level of the bottom. This has proven a valuable change in the equipment. A contract was also made for the removal of dead and down timber on the burnt-over lands. When this timber is removed the appearance of the hatchery grounds will be vastly improved.

DELAFIELD HATCHERY.

As instructed by the Commissioners the new pond south of the main building was completed. All filth, weeds and undesirable fish were removed from the ponds, leaving them in the best of condition for bass propagation the coming season.

The strip of land adjoining the hatchery lands was purchased at a cost of $400.00,

BAYFIELD HATCHERY, MAIN BUILDING.

Superintendents' Report.

WILD ROSE HATCHERY.

At this station no particular improvements were made, except in a minor way to help the general appearance of the grounds.

During the summer of 1912 most important research work was conducted at this station by Mr. Nathan Fasten of the Department of Zoology, University of Wisconsin, under the direction of Dr. E. A. Birge. The work was in the investigation of one of the copepods commonly known as "fish-lice". An exhaustive review of the work will be found in another part of this report.

STURGEON BAY AND SHEBOYGAN HATCHERIES.

The legislature of 1911 appropriated $10,000.00 for the erection of two new lake trout hatcheries. The members of the Board after considering a number of sites, located the hatcheries at Sturgeon Bay and Sheboygan. The land was donated to the state by the citizens.

The grounds at Sturgeon Bay formally belonged to the city and was occupied by the city lighting plant. The Commissioners have arranged for the purchase of an adjoining lot and the state is now in possession of a site having a frontage of 120 feet on Cedar street and extending a distance of about 200 feet to the waters of Sturgeon Bay including all riparian rights. The site at Sheboygan is a corner lot close to Lake Michigan and has a frontage of 100 feet on Wisconsin street, and a depth of 150 feet. Both plants are centrally located, are very convenient for the collection of eggs and the distribution of fry.

The buildings were erected during the summer of 1912. Both are similar in construction, measure 36x80 feet, are practically fireproof, and present a handsome appearance. Each plant has a capacity of 30 million lake trout eggs, and they will also include equipment to propagate as many bluefin as can be collected from the waters of Lake Michigan adjacent to Wisconsin. The plants are modern in every retray will carry about 6000 eggs, or 6 million eggs to every trough. has 42 compartments, each compartment carries 12 egg trays. Each tray will carry about 6000 eggs, or 6 million eggs to every trough. The buildings are steam heated, electric lighted and have both water and sewer connections. The second floor consists of a large storeroom and dwelling compartments for the foreman in charge of the hatchery.

The Sturgeon Bay hatchery now contains 9 million, and the Sheboygan 12 million lake trout eggs.

Superintendent's Report.

SUB-HATCHERY AT SPOONER.

The Fish Commission should establish a substation at Spooner to expedite the distribution of pike fry in that portion of the state. The lakes in that vicinity are fished by many people every summer as the waters are within easy traveling distance of St. Paul, Minneapolis, Superior and Duluth. As a consequence many outside people are interested in the waters and we receive a large number of applications for fry to plant in this portion of Wisconsin. Under the existing conditions the fry now distributed in these waters are shipped from the Oshkosh or Minocqua hatcheries, and are on the road from twelve to twenty hours. Should the weather be sultry and warm, and the fish be carried a long distance, great chances are taken in transporting the fry as part of them are likely to be lost. On such occasions we take every precaution and experienced men are sent with the fish. Every effort is made to carry the fry to their destination in good condition. Oftentimes, after the fish arrive at the railroad station, they must be hauled several miles and some times over rough roads. If the fish arrive at the station in a weak condition, it is hard to get them into the lakes as strong and hardy as we would like.

With a distribution center at Spooner we could easily ship the eggs from the collection grounds direct to Spooner for propagation. We could then distribute the fry from there to the numerous lakes in that portion of the state, and get them to the respective destinations within one to three hours. In this way the fish would always arrive at the stations in excellent condition. If this work is worth doing it is worth doing well.

This sub-hatchery should be built and equipped at a cost of not more than $1500.00. The station would not be in operation for more than sixty days during the year, and the running expense would not be large when compared with the great amount of good that would be accomplished.

ENFORCEMENT OF GAME LAWS.

The protection of fish in the commonwealth is closly allied with the propagation of fish. Without the vigilant warden system we have in this state, much of the work we do in replenishing the streams and lakes with fish fry, would be of little value. A few citizens in every locality would like their way in the wanton destruction of fish just at the time when on the eve of spawning, and when the fish are known to congegate in large numbers.

WILD ROSE HATCHERY, MAIN BUILDING.

Waushara County.

Superintendent's Report.

Mr. John A. Sholts, the present head of fish and game protection, is heart and soul in his work for the better protection of fish and game, and to see that our fish and game laws are strictly enforced.

Below we give an extract of game warden report and which indicates the active work of the department.

Respectfully submitted,

JAMES NEVIN,

Superintendent of Fisheries.

The following is a comparative statement of various items for the years 1910-1911:

		1910.	1911.
1.	Total number of arrests	910	953
2.	Total number of jail sentences	44	39
3.	Total number of cases lost	73	69
4.	Amount of fines imposed	$15,975 00	$17,613 00
5.	Amount of costs	3,657 82	3,376 32
6.	Amount of wardens' fees	782 69	815 28
7.	Amount of seizures	4,318 67	5,367 61
8.	Nonresident hook and line	8,606 50	8,560 10
9.	Lake Superior, Michigan and Green Bay	3,441 25	3,536 15
10.	Lake Pepin and Mississippi river	3,485 25	*3,204 15
11.	Set line licenses	1,777 65	*1,136 60
12.	Nonresident large game licenses	6,700 00	8,605 00
13.	Nonresident small game licenses	4,160 00	4,780 00
14.	Duplicate licenses	514 00	189 50
15.	Settlers' licenses	.....	481 00
16.	Supervision	.....	601 17
17.	Rough fish licenses	.....	82 75
18.	Miscellaneous	64 00	242 00
		$33,845 01	$37,711 31

*NOTE.—The cause of loss in license money received from set lines and Lake Pepin and the Mississippi river was due to exceptionally low water in the Mississippi river.

PROPERTY VALUES.

Madison Hatchery—	
63 acres of land, buildings, ponds and other improvements	$30,000 00
Inventory of equipment	3,179 20
Bayfield Hatchery—	
502 acres of land, buildings, ponds and other improvements	41,500 00
Inventory of equipment	4,437 00
Oshkosh Hatchery—	
City lot and building	2,500 00
Inventory of equipment	1,566 65
Minocqua Hatchery—	
275½ acres, buildings, ponds and other improvements thereon	24,250 00
Inventory of equipment	2,243 15
Delafield Hatchery—	
30 acres of land, buildings, ponds and other improvements thereon	26,500 00
Inventory of equipment	1,069 50
Wild Rose Hatchery—	
59½ acres of land, buildings, ponds and other improvements thereon	25,050 00
Inventory of equipment	874 45
Sturgeon Bay Hatchery—	
City lot 120 ft. by 200 ft., and buildings	10,000 00
Equipment	500 00
Sheboygan Hatchery—	
City lot 100 ft. by 150 ft., and buildings	10,000 00
Equipment	500 00
Fish car "Badger No. 1"	5,000 00
Fish car "Badger No. 2"	13,500 00
Total value	$204,669 95

Real estate holdings.....900 acres of land and three city lots

Commercial Fisheries.

COMMERCIAL FISHERIES.

1911.

Fish Caught in Lakes Superior, Michigan and Green Bay.

Kind.	Pounds	Value.
Whitefish	137,094	$13,655.22
Lake trout	5,144,120	480,208.22
Bluefin	158,684	7,529.70
Chub	2,304,362	107,847.16
Herring	5,247,424	72,284.50
Pike	152,711	15,520.55
Perch	1,242,311	27,112.23
Rough fish	992,796	19,242.80
Totals	15,379,502	$743,400.38

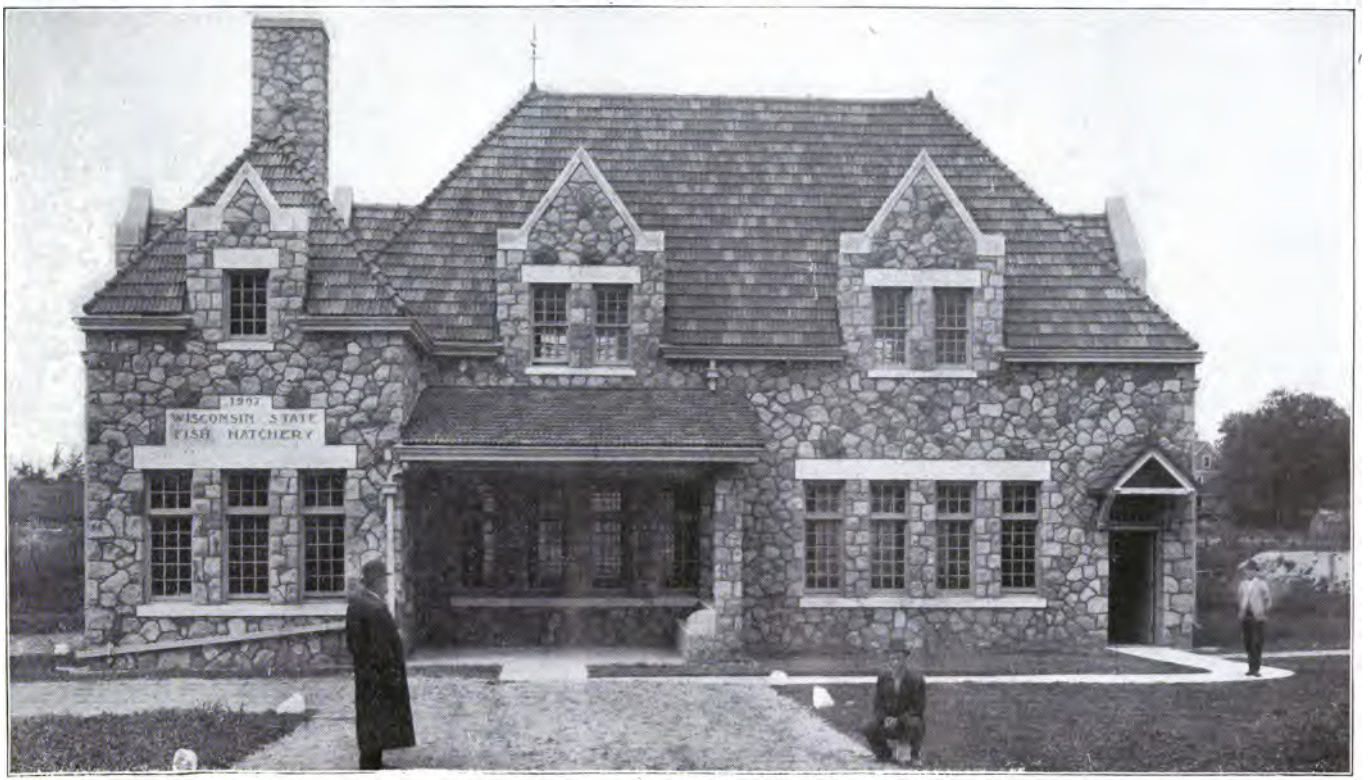
Increase in valuation over 1910.....$160,750.23

INCREASE OVER 1910 IN POUNDS.

Whitefish	50,078		
Lake trout	547,498		
Bluefin	.....	461,811	decrease.
Chub	320,398		
Herring	870,968		
Pike	36,066		
Perch	516,375		
Rough fish	147,751		
Totals	2,489,134	461,811	

Total value of boats	$301,153.59
Total value of nets	320,810.85
Total value of fish	743,485.63
Total capital	$1,365,450.03

The above statistics were taken from 439 reports made under oath by the commercial fishermen.



DELAFIELD HATCHERY. MAIN BUILDING, WAUKESHA COUNTY.

Financial Report.

FINANCIAL REPORT.

1910—1911.

RECEIPTS.

1910.		
July 1.	Balance on hand	$170.00
	Annual appropriation	37,000.00
Dec. 20.	Credit from Mississippi Fund	741.07
1911.		
June 30.	Nonresident License Fund	6,913.75
	Deficit to 1911-1912 account	6,120.65
		$50,945.47

DISBURSEMENTS.

1911.		
June 30.	James Nevin, salary one year	$2,500.00
	B. O. Webster, salary nine months	1,1250.00
	R. S. Scheibel, salary one year	1,200 00
	Matt Patterson, salary one year	900.00

MADISON HATCHERY.

Valentine Maag, salary one year	$855.00
F. E. Meade, salary one year	661.70
Frank Purcell, salary five months	206.65
Albert Gallagher, salary three months	255.00
Sundry employment	427.00
Filling ice house	45.54
Fish food	1,395 88
Supplies, repairs, equipment	1,554.24
Permanent improvements	2,421.74
Supplies for barn	162.10
	$7,984.85

BAYFIELD HATCHERY.

Robert Ripple, salary one year	$1,200.00
Bernard Holtmen, salary five months	300.00
Andrew Gilquist, salary four months	160.00
John Harberg, salary one year	720.00
Fred Wahlquist, salary one year	675.00
Andrew Wahlquist	600.00
Frank Purcell, salary three months	180.00
Sundry employment	195.00
Fish food	1,602.32
Collecting lake trout eggs	237.20
Supplies, repairs, equipment	759.81
Barn supplies	144.87
Permanent improvements	240.40
	$7,014.60

Financial Report.

OSHKOSH HATCHERY.

1911.		
June 30.	John Maag, salary one year	$1,200.00
	Sundry employment	599.50
	Water rent	557.82
	Supplies, repairs, equipment	270.57
	Collecting lake trout eggs	225.17
	Collecting bluefin eggs	136.98
	Collecting pike eggs	1,884.56
		$4,874.10

MINOCQUA HATCHERY.

F. E. Hewitt, salary one year	$840.00
Sundry employment	109.83
Barn supplies	138 93
Supplies, repairs, equipment	850.25
Permanent improvements	1,114.51
Collecting pike eggs	1,139.94
Collecting bass breeders	214.01
	$4,407.47

DELAFIELD HATCHERY.

Albert Gallagher, salary seven months	$630.00
B. O. Webster, salary three months	375.00
Sundry employment	424.67
Pond work	248.85
Supplies, repairs, equipment	442.90
Collecting pike eggs	285.50
Collecting bass breeders	453.30
	$2,860.22

WILD ROSE HATCHERY.

P. G. Zalsman, salary one year	$1,140.00
F. C. Ramsdale, salary one year	720.00
James Foy, salary four months	240.00
H. J. Oberholtzer, salary three months	180.00
Sundry employment	337.90
Permanent improvements	5,062.33
Supplies, repairs, equipment	1,474.84
Fish food	597.78
Filling ice house	35.38
	$9,788.23

MISCELLANEOUS.

Transportation and Distribution of Fish	$7,110.86
State Fair Exhibit	184.58
Sundry expenses	10[illegible].12
Maintaining fish car	28.95
State Insurance Premium	151.86
Mississippi river Work	53.94
Expenses James Nevin, one year	653.67
	$8,291.00

RECAPITULATION.

Superintendent and office force	$5,725.00
Madison Hatchery	7,984.85
Bayfield Hatchery	7,014.00
Oshkosh Hatchery	4,874.10
Minocqua Hatchery	4,407.47
Delafield Hatchery	2,860.22
Wild Rose Hatchery	9,788.23
Miscellaneous	1,180.14
Total for one year	$50,945.47

Financial Report.

MISSISSIPPI RIVER FUND.

1910.			
July 1.	Balance on hand	$320.20	
	Receipts for fiscal year	3,383.00	
1911.			
June 30.	Refund to regular fund		$741.07
	Balance on hand		2,962.13
		$3,703.20	$3,703.20

FINANCIAL REPORT.

Year 1911—1912.

RECEIPTS.

1911.		
July	Appropriation ch. 527, laws 1911	$59,342.44
	Appropriation sec. 1496a	405.48
	Special appropriation, ch. 27, laws 1911	2,500.00
Nov. 24.	Proceeds team sold	330.00
Dec. 8.	Tapping electric light wire at Bayfield	1.00
29.	Ice sold at Wild Rose	17.50
Jan. 25.	Down timber sold at Minocqua	20.00
	Total	$62,616.42

DISBURSEMENTS.

James Nevin, salary	$2,500.00
R. S. Scheibel, salary	1,500.00
Matt Patterson	1,080.00
James Nevin, expenses 12 months	558.14
	$5,638.14

MADISON HATCHERY.

Albert Gallagher, salary	$1,200.00
Benjamin Durkee, salary	840.00
Valentine Maag, salary	720.00
F. E. Meade, salary	690.00
B. F. Holtman, salary	300.00
Sundry employment	338.75
Fish food	1,198.72
Supplies and repairs	731.74
Equipment	947.55
Barn expense	424.85
Improvements	2,015.88
	$9,402.29

Financial Report.

BAYFIELD HATCHERY.

Robert Ripple, salary	$1,440.00
John Hagberg, salary	720.00
Fred Wahlquist, salary	720.00
Andrew Wahlquist, salary	610.00
Frank Purcell, salary	60.00
Andrew Gilquist, salary	370.00
Sundry employment	517.25
Fish food	1,037.25
Supplies and repairs	790.88
Equipment	323.94
Barn expense	121.15
Improvements	1,300.24
Land purchased	200.00
Filling ice house	101.75
Repairing Birch Run Dam	320.65
	$8,693.38

OSHKOSH HATCHERY.

John Maag, salary	$1,200.00
Sundry employment	605.00
Water rent	606.52
Supplies and repairs	171.22
Equipment	124.31
	$2,707.05

MINOOQUA HATCHERY.

F. E. Hewitt, salary	$840.00
Sundry employment	394.25
Supplies and repairs	627.89
Equipment	106.15
Barn expense	169.53
Collecting bass breeders	119.07
Improvements	1,254.67
	$3,511.49

DELAFIELD HATCHERY.

B. O. Webster, salary	$1,500.00
Sundry employment	687.45
Supplies and repairs	169.01
Equipment	54.44
Improvements	524.12
Land purchased	400.00
	$3,335.02

WILD ROSE HATCHERY.

P. G. Salzman, salary	$1,200.00
F. O. Ramsdale, salary	720.00
Sundry employment	1,158.75
Fish food	731.57
Supplies and repairs	320.92
Equipment	52.90
Improvements	1,460.16
	$5,644.30

Financial Report.

DISTRIBUTION AND TRANSPORTATION.

Mileage	$1,920.00
Telephone and telegraph	406.50
Salaries and sundry employment	626.65
Drayage, freight, express	1,549.17
Supplies and repairs	312.84
Repairing car "Badger"	1,069.50
Employees' expenses	2,043.85
	$7,928.51

COLLECTING SPAWN.

Lake trout (Superior)	$245.78
Lake trout (Michigan)	324.32
Wall-eyed pike	1,846.61
Whitefish	339.88
	$2,756.59

MISCELLANEOUS.

Fishway tests	$280.00
Research work	381.95
State Fair exhibit	296.83
Miscellaneous	116.72
	$1,889.92

Total receipts	$62,616.42	
Total disbursements		$51,506 69
Deficit June 30, 1911, paid		6,120.65
Balance on hand July 1, 1912		4,989.08
	$62,616.42	$62,616.42

DISTRIBUTION OF FISH.

SUMMARY OF OUTPUT OF HATCHERIES, 1911.

MADISON HATCHERY:		
Brook trout, advanced fry	890,000	
Rainbow trout, advanced fry	1,460,000	
Furnished fairs and aquariums	75	
Mature rainbow trout	1,500	
		2,351,575
BAYFIELD HATCHERY:		
Brook trout, advanced fry	2,864,000	
Rainbow trout, advanced fry	1,628,000	
Rainbow trout yearlings	100,800	
Lake trout fry	13,517,000	
Furnished fairs and aquariums	240	
Lake trout eggs, exchanged	100,000	
		18,210,040
OSHKOSH HATCHERY:		
Lake trout fry	6,230,000	
Whitefish fry	3,750,000	
Bluefin fry	4,375,000	
Wall-eyed pike fry	35,760,000	
Lake trout eggs, exchanged	100,000	
		50,215,000
MINOCQUA HATCHERY:		
Wall-eyed pike fry	52,690,000	
Black bass fry	910,000	
Muskellunge fry	200,000	
Pickerel fry	580,000	
Lake trout fry	1,210,000	
		55,590,000
DELAFIELD HATCHERY:		
Wall-eyed pike fry	33,300,000	
Black bass, advanced fry	406,000	
Black bass fingerlings	27,600	
Lake trout fry	658,580	
Miscellaneous	25,325	
		34,417,505
WILD ROSE HATCHERY:		
Brook trout, advanced fry	1,144,000	
Brook trout eggs, exchanged	30,000	
		1,174,000
MISSISSIPPI RIVER:		
Black bass fingerlings	56,600	
Rough fish	155,700	
		212,300
State Fair fish		615
Lake trout eggs impregnated and planted		10,419,500
Total		172,590,535

MADISON HATCHERY. NEW FRY PONDS.

Dane County.

Distribution of Fish.

SUMMARY OF OUTPUT OF HATCHERIES, 1912.

MADISON HATCHERY:		
Brook trout, advanced fry	2,050,400	
Rainbow trout, advanced fry	2,098,000	
Furnished fairs and aquariums	105	
Mature rainbow trout	1,500	
		4,150,003
BAYFIELD HATCHERY:		
Brook trout, advanced fry	3,100,000	
Rainbow trout, advanced fry	565,200	
Rainbow trout, fingerlings	56,000	
Lake trout fry	14,848,667	
Steel-head trout	100,000	
Furnished fairs and aquariums	240	
Exchanged rainbow trout eggs	200,000	
Furnished Wild Rose Hatchery brook trout, advanced fry	30,000	
		18,900,107
OSHKOSH HATCHERY:		
Wall-eyed pike fry	16,440,000	
Lake trout fry	7,325,500	
Whitefish fry	10,080,000	
Bluefin fry	3,150,000	
Exchanged lake trout eggs	150,000	
		37,145,500
MINOCQUA HATCHERY:		
Wall-eyed pike fry	85,650,000	
Black bass fry	172,000	
Muskellunge fry	125,000	
Pickerel fry	2,400,000	
		83,347,000
DELAFIELD HATCHERY:		
Wall-eyed pike fry	51,150,000	
Black bass, advanced fry	53,000	
Black bass, fingerlings	5,150	
Black bass, yearlings	698	
		51,208,848
WILD ROSE HATCHERY:		
*Brook trout, advanced fry	2,100,000	2,100,000
MISSISSIPPI RIVER:		
Black bass fingerlings	6,612	
Rough fish fingerlings	384,365	
		390,977
Pickerel fingerlings from Wolf river		5,259
State Fair fish		615
Total		202,248,302

*2,000,000 eyed brook trout eggs sent to Madison and Bayfield Hatcheries. This does not include lake trout eggs impregnated and planted.

Distribution of Fish.

DISTRIBUTION OF FISH, BY COUNTIES, 1911.

	Brook trout advanced fry.	Rainbow trout advanced fry.	Wall-eyed pike fry.	Black bass fry.	Black bass advanced fry.	Black bass finger-lings.
Adams	8,000					
Ashland	64,000	30,000	720,000	8,000		
Barron	176,000	134,000	2,585,000	18,000		
Bayfield	290,000	68,000	1,980,000	52,000		
Brown	40,000					
Buffalo	68,000	6,000	180,000			
Burnett			220,000			
Calumet			715,000		4,500	
Chippewa	144,000	86,000	3,115,000	32,000		400
Clark	44,000	20,000	720,000			700
Columbia	66,000	70,000	2,460,000		19,500	
Crawford	26,000	6,000				
Dane	52,000	52,000	600,000		24,000	3,925
Dodge	22,000	12,000	780,000		2,500	
Door			180,000		4,000	
Douglas	238,000	82,000	2,970,000	120,000		
Dunn	142,000	84,000	1,500,00			
Eau Claire	116,000	44,000	840,000			
Florence	38,000	44,000	995,000	8,000	14,500	
Fond du Lac	132,000	28,000	1,920,000		10,000	800
Forest	54,000	40,000	2,200,000	20,000		
Grant	58,000	52,000	480,000		9,500	
Green	32,000	18,000	360,000		6,000	
Green Lake			360,000			
Iowa	52,000	60,000			1,500	
Iron	86,000	40,000	2,585,000	24,000		
Jackson	130,000	64,000				
Jefferson		2,000	720,000		6,500	12,000
Juneau	88,000	62,000	1,040,000		18,000	
Kenosha			1,920,000		25,000	
Kewaunee	48,000	80,000	240,000		19,500	
La Crosse	34,000	50,000	600,000		6,000	
Lafayette	30,000	16,000	960,000		2,500	
Langlade	26,000	22,000	1,375,000	4,000		
Lincoln	134,000	56,000	1,980,000	42,000		
Manitowoc	44,000	14,000	1,560,000	42,000		
Marathon	86,000	92,000	3,505,000	38,000		600
Marinette	114,000	130,000			32,000	
Marquette	44,000	14,000	1,080,000		21,000	
Milwaukee			120,000		1,000	
Monroe	156,000	64,000	240,000		9,000	
Oconto	40,000	50,000	1,210,000		30,000	
Oneida	34,000	48,000	10,065,000	102,000		13,900
Outagamie						
Ozaukee		4,000	110,000		2,000	
Pepin	32,000	6,000	540,000			
Pierce	186,000	128,000				
Polk	56,000	12,000	990,000			
Portage	84,000	32,000	1,200,000		2,000	
Price	90,000	82,000	900,000			
Racine			960,000		13,000	
Richland	50,000	36,000	780,000		8,000	
Rock		8,000			4,500	
Rusk	94,000	64,000	1,375,000			
St. Croix	68,000	118,000	1,320,000			
Sauk	72,000	54,000	2,400,000		11,000	
Sawyer	76,000	64,000	975,000	18,000		
Shawano	98,000	100,000	715,000	52,000		
Sheboygan	42,000	16,000	275,000		13,000	
Taylor	36,000	44,000	1,140,000			
Trempealeau	142,000	80,000	180,000			
Vernon	118,000	146,000	1,080,000		5,000	
Vilas	36,000	84,000	8,360,000	234,000		17,800
Walworth	30,000	22,000	2,640,000		32,500	
Washburn	94,000	88,000	3,795,000	62,000		1,700

MINOCQUA HATCHERY. MAIN BUILDING. ONEIDA COUNTY.

Distribution of Fish.

DISTRIBUTION OF FISH, BY COUNTIES, 1911.—Continued.

	Brook trout advanced fry.	Rainbow trout advanced fry.	Wall-eyed pike fry.	Black bass fry.	Black bass advanced fry.	Black bass fingerlings.
Washington	26,000	16,000	1,380,000	.....	9,500	.....
Waukesha	40,000	32,000	22,020,000	.....	47,500	14,275
Waupaca	118,000	16,000	660,000	4,000	10,000	1,600
Waushara	262,000	50,000	1,920,000	.....	6,500	3,200
Winnebago	.....	8,000	8,160,000	.....	.....	12,000
Wood	92,000	38,000	2,795,000	.....	.....	800
	4,898,000	3,088,000	121,750,000	910,000	406,000	83,400

RECAPITULATION OF FISH DISTRIBUTED, 1911.

Brook Trout, Advanced Fry	4,898,000
Rainbow Trout, Advanced Fry	3,088,000
Lake Trout Fry	21,615,580
Lake Trout, impregnated eggs	10,419,500
Whitefish Fry	3,750,000
Bluefin Fry	4,375,000
Black Bass Fry	910,000
Black Bass, Advanced Fry	406,000
Black Bass Fingerlings	84,200
Muskellunge Fry	200,000
Pickerel Fry	580,000
Wall-eyed Pike Fry	121,750,000
Miscellaneous	514,255
Total	172,590,535

Distribution of Fish.

DISTRIBUTION OF FISH, BY COUNTIES, 1912.

	Brook trout advanced fry.	Rainbow trout advanced fry.	Wall-eyed pike fry.	Black bass fry.	Black bass advanced fry.
Adams	34,600	18,000	.....	.....	.....
Ashland	134,000	43,200	200,000	.....	.....
Barron	264,000	43,200	1,750,000	.....	.....
Bayfield	196,000	108,000	2,650,000	26,000	.....
Brown	8,800	10,000	.....	.....	.....
Buffalo	136,000	8,000	.....	.....	.....
Burnett	10,000	40,000	1,300,000	.....	.....
Calumet	.....	.....	.....	.....	.....
Chippewa	192,000	10,800	780,000	.....	.....
Clark	70,000	46,000	240,000	.....	.....
Columbia	78,600	62,000	1,350,000	.....	.....
Crawford	66,000	12,000	.....	.....	.....
Dane	68,200	94,000	13,950,000	.....	.....
Dodge	8,800	8,000	1,100,000	.....	.....
Door	8,800	.....	.....	.....	.....
Douglas	228,800	54,000	5,150,000	.....	.....
Dunn	172,000	75,600	960,000	.....	.....
Eau Claire	193,000	34,800	2,280,000	.....	.....
Florence	42,800	70,000	1,850,000	4,000	.....
Fond du Lac	120,400	34,000	200,000	.....	.....
Forest	88,000	18,000	1,900,000	28,000	.....
Grant	110,000	124,000	1,400,000	.....	.....
Green	35,200	.....	500,000	.....	.....
Green Lake	.....	.....	.....	.....	.....
Iowa	140,000	102,000	300,000	.....	.....
Iron	58,000	.....	3,750,000	.....	.....
Jackson	260,000	.....	150,000	.....	.....
Jefferson	8,800	.....	1,000,000	.....	9,000
Juneau	126,000	76,000	950,000	.....	.....
Kenohsa	8,800	.....	650,000	.....	7,000
Kewaunee	63,800	44,000	.....	.....	.....
La Crosse	147,400	20,000	1,700,000	.....	.....
Lafayette	35,200	30,000	1,050,000	.....	.....
Langlade	60,000	10,000	950,000	18,000	.....
Lincoln	162,000	74,000	3,800,000	.....	.....
Manitowoc	36,000	32,000	2,000,000	.....	.....
Marathon	114,000	68,000	2,100,000	.....	.....
Marinette	254,000	163,000	2,950,000	.....	.....
Marquette	60,600	32,000	1,000,000	.....	.....
Milwaukee	.....	.....	.....	.....	.....
Monroe	193,200	42,000	250,000	.....	2,000
Oconto	104,800	66,000	600,000	36,000	.....
Oneida	96,000	.....	17,850,000	14,000	.....
Outagamie	8,000	.....	.....	.....	.....
Ozaukee	.....	6,000	950,000	.....	.....
Pepin	28,000	.....	.....	.....	.....
Pierce	26,000	159,800	.....	.....	.....
Polk	114,000	.....	900,000	.....	.....
Portage	103,200	69,000	980,000	.....	.....
Price	92,000	.....	1,600,000	.....	.....
Racine	.....	.....	150,000	.....	2,500
Richland	92,400	96,000	300,000	.....	.....
Rock	.....	16,000	400,000	.....	4,000
Rusk	128,000	.....	800,000	.....	.....
St. Croix	140,000	41,400	2,220,000	.....	.....
Sauk	79,200	66,000	1,400,000	.....	.....
Sawyer	78,000	.....	760,000	12,000	.....
Shawano	212,000	46,000	3,000,000	16,000	.....
Sheboygan	20,000	.....	1,600,000	.....	.....
Taylor	48,000	.....	1,600,000	.....	.....
Trempealeau	216,000	38,000	1,100,000	.....	.....
Vernon	287,000	110,000	.....	.....	.....
Vilas	202,000	.....	17,700,000	.....	.....
Walworth	74,800	76,000	3,300,000	.....	17,500
Washburn	136,000	41,400	5,350,000	18,000	.....

Distribution of Fish.

DISTRIBUTION OF FISH, BY COUNTIES, 1912.—Continued.

	Brook trout advanced fry.	Rainbow trout advanced fry.	Wall-eyed pike fry.	Black bass fry.	Black bass advanced fry.
Wash'ngton	16,000	18,000	1,020,000	.....	5,000
Waukesha	103,400	22,000	16,900,000	.....	6,000
Waupaca	176,400	34,000	1,480,000	.....	.....
Waushara	360,000	72,000	2,300,000	.....	.....
Winnebago	.....	.....	7,800,000	.....	.....
Wood	104,800	76,000	1,020,000	.....	.....
	7,250,400	2,663,200	153,240,000	172,000	53,000

RECAPITULATION OF FISH DISTRIBUTED, 1912.

Brook Trout, Advanced Fry	7,250,400
Rainbow Trout, Advanced Fry	2,663,200
Rainbow Trout Fingerlings	55,000
Lake Trout Fry	22,174,167
Whitefish Fry	10,080,000
Bluefin Fry	3,150,000
Wall-eyed Pike Fry	153,240,000
Black Bass Fry	172,000
Black Bass, Advanced Fry	53,000
Muskellunge Fry	125,000
Pickerel Fry	2,400,000
Pickerel Fingerling	5,250
Rough Fish, Mississippi river	384,365
Miscellaneous	483,158
Black Bass Fingerlings	11,762
	202,248,302

This does not include lake trout eggs impregnated and planted.